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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Plant Industry, Soils
and Agricultural Engineering

H. T. & S. Office Report No. 226

Transportation Test of Underslung Charcoal Heaters in Fan Cars With Bananas, New Orleans to Winnipeg, February 1950

By

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Division of Fruit and Vegetable Crops and Diseases

Beltsville, Maryland
June 5, 1950

Transportation Test of Underslung Charcoal Heaters
in Fan Cars With Bananas - New Orleans to
Winnipeg - February 1950

The underslung type charcoal heater (Luminator-Mitchel) has been in fairly extensive use for some time on refrigerator cars of the Canadian railroads, but it has been installed on very few cars on lines in the United States and then only on an experimental basis. This system makes use of a heating unit mounted underneath the car floor connected to a pipe coil installed inside the car under the floor racks, running entirely around the car, 8 to 10" away from the walls. The liquid in the system is heated in the fire box and circulates by convection through the coil. Temperature control is maintained by manipulating an adjustable damper to regulate the fire or by the use of a newly devised thermostat valve that controls the flow of liquid from the heater into the coil.

As the temperature of bananas must be kept within a very narrow range during shipment (from about 53° to 58°F. depending on state of maturity), the performance of car heaters has been of great concern to the banana shipping interests. Therefore, the Fruit Dispatch Company in cooperation with the Illinois Central Railroad has installed a number of heaters of this type both manually and thermostatically controlled, in refrigerator cars used in the banana movement. The U.S. Department of Agriculture was requested to conduct a transportation test to compare the performance of these types of underslung heaters and the standard portable charcoal heater used in regular service in end bunker fan cars. The Burlington Refrigerator Express Company has also installed underslung heaters in some of its new fan cars and two were furnished for this test.

EXPERIMENTAL EQUIPMENT AND PROCEDURE.

Seven cars were used in this test, five of which were Illinois Central cars and two Burlington Refrigerator Express Company cars. Three of the former cars were equipped with underslung heaters and two were standard end bunker fan cars for comparison. The list of cars together with the heaters used were as follows:

Car No.	Heater	Control
A-IC 50493	Underslung	Thermostatic
B-IC 50357	"	"
C-IC 50470	Portable (check)	Manual
D-IC 50437	Underslung	"
E-IC 50441	Portable (check)	"
F-BREX - 74398	Underslung	"
G-BREX - 74399	"	"

Test cars

All the IC cars were of the same series and were recently rebuilt and equipped with fans. They contained 3-3 1/2" of insulation and diagonal slatted floor racks. The BREX cars were new just out of the shops and had 4-4 1/2" of insulation. Car F was equipped with the Duryea sliding underframe and had Preco fans of the usual design installed beneath the floor-racks

whereas car G was equipped with conventional draft gear and new Preco overhead fans. Both BREX cars had wall flues whereas the IC cars did not. While car F was equipped with thermostatic control and heat exchanger, the thermostat was inoperative and the car was controlled manually on this test. The cars were in excellent condition and acceptable for banana loading. All cars except the two standard end-bunker fan cars (C and E) were equipped with Liquidometer thermometers for readings of air temperature at the top and bottom centerline doorway positions.

Heaters

The Luminator-Mitchel underslung heater is permanently attached under the floor to the left of the doorway where it is readily accessible from the ground for servicing and control. The heater contains a heating coil in the firebox which is connected to the single pipe coil in the car. In cars having fans under the floor racks the coil did not extend to the bulkhead but crossed over to the opposite side about 12" from the fan housing. In the overhead fan car (G) it extended to within 12" of the bulkhead. The fluid in the pipe was a mixture of 40 percent water and 60 percent Prestone. Regular sized charkets burned in the firebox, warm the fluid and cause a flow through the pipe coil in the car. In the system with the thermostatically controlled valve, flow through the coil is cut off by thermostatic action and bypassed into a finned heat exchanger mounted under the car beside the heater. In this way the fluid in the firebox coils is not overheated when circulation through the car is stopped. The bulb controlling the thermostat valve is located under the floor racks adjacent to the bottom Liquidometer bulb at the centerline doorway position. The burning rate of both types of underslung heater is controlled by an adjustable damper which has eight positions. The zero position closes the damper completely and is used to extinguish the heater. The heat input in the manually controlled heaters is controlled exclusively by this damper. This control usually is based on the Rules set forth by the Canadian National Railways "Code of Rules for Handling Perishable Traffic"-Circular No. 19-D, but in this test the banana temperatures at the doorway were used instead of air temperatures as a guide for the damper adjustment. Up to 100 lbs. of charkets may be put into the fuel magazine although 60 lbs. is considered a normal charge.

The portable charcoal heaters used in the two check cars were the regular small two-piece banana heater - Klauer Model O-39. Two regular one piece Simplex charcoal heaters were installed at Grand Forks in Car A and one was removed from this car and placed in Car F at Noyes. Fuel capacity of the two-piece heaters is 23 pounds while that of the standard one-piece heater is approximately 30 lbs.

COMMODITY AND AIR TEMPERATURES.

Ten commodity and two air temperatures were obtained by means of distant reading electric resistance thermometers. The positions in which these were placed are as follows:

Position	Designation
Bottom bunker center line, head and rear	BBCL-H, BBCL-R
Top bunker center line, head and rear	TBCL-H, TBCL-R
Bottom bunker eastside over corner of pipe, head and rear	BBES-H, BBES-R
Top quarter length, centerline, head and rear	TQCL-H, TQCL-R
Bottom over coil intake, near doorway	BOT. intake
Bottom over coil return, near doorway	BOT. return
Top Liquidometer bulb position (Air)	Top Liquidometer
Bottom Liquidometer bulb position (Air)	BOT. Liquidometer

Bottom fruit temperatures were taken by inserting a resistance thermometer in a banana in the bottom hand of the bunch nearest the desired position. The distance above the floor rack was from 10 to 12 inches. Top positions were in a top banana of one of the top layer bunches which were placed horizontally on the upright bunches and were approximately 45" above the floor rack. The designations in respect to head and rear ends and east side were valid only as far as Chicago. Here the cars were reversed during switching and they were in reversed position for the balance of the trip. However, the starting designation was used in the tables. All the underslung heaters were on the east side of the cars leaving New Orleans and the intake and return to the coils were also on that side. Fruit temperatures were taken at the floor level just above the warmer inlet and cooler outlet of the coil to measure their effect on fruit temperature. Commodity and air temperatures were taken at the same positions in all cars to facilitate comparison of temperatures. Liquidometer air temperatures were checked by placing a resistance thermometer adjacent to the Liquidometer bulbs. Here again the same positions were also used in the check cars even though they were not equipped with Liquidometers.

Fruit (pulp) temperatures were read by Fruit Dispatch Company messengers at all regular inspection stations. These temperatures were taken with hand thermometers in bananas near the bottom and at the top of bunches at the doorway in accordance with the regular inspection practice. Ventilators were manipulated and heaters lit in accordance with the temperatures shown by these inspections.

LOADING AND ROUTING

The test cars were loaded between 4:45 PM and 10:30 PM on February 13. The bananas were of the Fortuna variety and were in excellent condition. All loads were identical and consisted of 1 1/2 layers of stems. Stems in the bottom layer were placed upright on the stalks in alternate rows, while the top layer was placed horizontally in a T shape at each end of the car. In other words, 2 stems were laid crosswise of the car over the 4 end stacks at each end of the car then one stem at the centerline over the next 4 or 5 stacks, making from 12 to 14 stems in the second layer at each end. In addition 2 "Key"

bunches were placed crosswise of the load at the doorway. These worked down to the floor racks as slack develops in the load in transit. This type of loading is called "one and one half" and the number of rows or stems in the top layer in each end as 12 and 12 flat or 14 and 14 flat. The stem size was "light average nines" or having nine or more hands per stem. Complete loading data are shown in table 1.

The cars were assembled at Sty Dock yards (New Orleans) and the first temperature reading was taken at 3 AM February 14. The train was made up and departed at 6:55 AM. Routing was IC, CB&Q, G.N. and Midland Railroads. Total elapsed time from New Orleans to Winnipeg was 119 hours 5 minutes of which 61 hrs. 45 minutes (52%) was running. As previously noted the train was wyed in Chicago resulting in a reversal of all the test cars. In the check cars, heaters were placed in what was the actual head end after turning but this was the rear end when leaving New Orleans and the designation of positions in the temperature tables. This must be kept in mind when studying the temperatures in these two cars.

TEST PROCEDURE

Rear vents were opened 2" with the ventilators resting on the irons in all cars prior to departure from New Orleans since fruit temperatures were a little warmer than desired, about 60°, 8 to 10 hours after loading. Cooler weather was encountered on the day of departure (Feb. 14) and temperatures down to freezing at Memphis were experienced early the following morning. By this time the fruit temperatures in all cars except E had dropped about 3 degrees so that vents were closed at this point. As car E had slightly higher temperatures, one vent was left open to the next regular inspection point at Fulton, Ky. when it was also closed. Vents on all cars remained closed for the balance of the trip.

All of the heaters were fueled with 60 lbs. of charkets at Fulton Ky. even though they were not lit at this point. Upon arrival at Markham Yards, Chicago, fruit temperatures and a forecast of zero weather overnight indicated the need for heat. Accordingly, one portable heater was installed in a bunker of each check car and all heaters were lit. The draft on underslung heaters with thermostatic control was set on position 6 while on the manually controlled it was set on 2. Subsequent changes in draft setting were made in accordance with fruit temperature and are shown in the individual heater record sheets (Tables 10 to 16). The thermostat in car A apparently was not operating properly as temperatures could not be maintained in the car even after setting it up to 70°. Therefore at Grand Forks, two portable heaters were installed in the bunkers and the underslung heater draft set at zero to extinguish it. Low temperatures in car F made it necessary to install a portable heater in that car at Noyes.

The resistance thermometers were read at all terminal stops or oftener and averaged 3 per day. Doorway commodity temperatures and Liquidometer readings were taken and the fruit inspected at the regular banana inspection stations. These were Jackson, Memphis, Fulton, Bluford, Chicago, E. Dubuque, St. Paul, Grand Forks and Winnipeg. Supplementary inspections were made by the test party at Fargo and Noyes. A final inspection and temperature reading was made at Winnipeg just prior to unloading, and final inspection of heaters was made just after unloading.

DISCUSSION OF RESULTS

The weather at New Orleans was about normal during loading. Cooler weather was encountered the first day in transit, with a low of 32° that night. Temperatures were about normal for the balance of the trip with a low of 18° below zero upon arrival in Winnipeg. See Figure 1 for the outside air temperatures. In general, the weather was favorable for a heater test of this nature.

Manually Controlled Underslung Heaters

The manually controlled underslung heaters in cars D and G operated satisfactorily and maintained desired fruit temperatures in the car. In Car D, the initial draft setting of 2 was sufficient to raise load temperatures from 54° to 57° when outside temperatures were as low as - 5°F. However, a drop of 1 1/2° between Fargo and Grand Forks prompted the re-setting of the draft to 4. This was changed to 6 at Winnipeg the next day in order to insure temperatures between 55 and 60° prior to unloading, the next morning. (Table 13) Fuel consumption was approximately 70 lbs. for the burning period. Fruit temperatures were very uniform (Fig. 5) with practically no difference between the average top and bottom positions. At the first inspection after lighting the heater in car G. the draft was moved up to position 6 because of a drop of 1 1/2° in load temperatures. This resulted in 5° rise in temperature by St. Paul 12 hours later and the draft was re-set to 2. Below zero weather by the next morning resulted in a slight temperature drop and the draft was advanced to position 4 at Fargo. An additional slight loss in temperature during that day prompted advances of the draft positions to 6 and 7. (Table 16) Commodity temperatures were very uniform as shown in Fig. 8. A total of approximately 100 lbs. of fuel was consumed. The heater on car F was also manually controlled but apparently there was some obstruction to the flow of liquid as the temperature could not be maintained.1/ As shown in Table 15 the original draft setting of 2 at Chicago was advanced to 6 at E. Dubuque but re-set to 2 at St. Paul after a satisfactory increase in load temperatures. Further drops in load temperature during the below zero outside temperatures that followed could not be stopped by opening the draft wider so a portable charcoal heater (taken from car A) was installed at Noyes. This raised temperatures inside satisfactorily so the portable heater was removed at 5 PM the same day. The underslung heater maintained a satisfactory temperature overnight till unloading the next morning although commodity temperatures dropped 2 1/2° during that time. A total of 110 lbs. of fuel was burned in the underslung heater while the amount in the portable was not determined. Temperature curves for this car (Fig. 7) clearly show the effects of the portable heater. In general the temperatures were excellent in these cars.

1/ As noted previously, this heater was operated manually although equipped with a thermostat and heat exchanger. Subsequent examination of the thermostat valve by the manufacturers' representatives indicates that the valve was apparently not in full open position resulting in the bypassing of some of the heated fluid through the heat exchanger which reduced the temperature of the fluid in the entire system. This lowered temperature was apparently the cause of the inability to maintain car temperatures during very cold outside air temperatures.

Thermostatically Controlled Underslung Heaters

Cars A and B were thermostatically controlled. Car B performed very satisfactorily as shown by the record in Table 11. As indicated the thermostat was reset from 55 to 50° because of an apparent faulty calibration but its performance for the balance of the trip was satisfactory. Although the draft was advanced to 7 on the afternoon prior to unloading there was a half degree drop in top doorway temperatures. The cars were standing most of this period and the lack of car motion apparently reduced the burning rate of the heaters. Commodity temperatures are presented in Fig. 3 and again show the effects of the fans. Although the heater of car A appeared to be burning satisfactorily, it was apparent at the first inspection at East Dubuque, (Table 10) that the car was not heating properly 2/. The draft was kept at position 6 and the thermostat was re-set to 60° and a slight rise in commodity temperatures was noted at St. Paul. The draft then was set back to 4. The next morning at Fargo banana temperatures were down another half degree and the thermostat was set up to 70° and the draft to 7. A further drop was noted at Grand Forks so 2 portable heaters were installed and the underslung heater extinguished. Temperatures in the car rose rapidly so one heater was removed 11 hours later at Noyes and one left in until unloading. The effects of lighting the portable heaters may be clearly seen in Fig. 2. Top and bottom fruit temperatures were quite uniform throughout the test and only started to spread after the portable heaters were installed and during the standing period in Winnipeg. Fig. 2 shows the excellent temperature record of car B.

CHECK CARS WITH PORTABLE HEATERS IN THE BUNKERS

The two check cars (C and E) had excellent temperature records as shown in Figs. 4 and 6. The heater records are as given in Tables 12 and 14 and show a much lower fuel consumption than any of the underslung heater cars. Car C used an estimated 27 lbs. while car E used 25 lbs. as compared with a minimum of 70 lbs. for the others. As has been shown in previous tests, the use of regular charcoal heaters in fan cars provide very satisfactory temperatures.

Inspection of the cars at destination showed all loads to be in good order with a minimum of shifting and damage. The bananas were in excellent condition, being fresh and green with a very small percentage of the fruit turning or ripe as shown below:

Car	No. of Stems Ripe	Turning
A	2	7
B	5	15
C	1	26
D	2	10
E	4	3
F	16	2
G	12	2

2/ Examination of the thermostat valve by the manufacturers'representatives indicates that a condition similar to that found in Car B existed with lowered fluid temperature being unable to maintain proper car temperature.

Unloading conditions varied from complete exposure at some locations where the car doors were open to the outside air and the stems were carried out across the unloading platform to complete protection at others when a canvas enclosure around the car door and dock area has been provided.

Very little difference in temperature was noted in fruit loaded over the intake end of the heating coil as compared with that over the outlet. The maximum spread was found in Car G when the difference was only 2 to 3°. The rest of the cars showed 1° or less. This slight difference was apparently due to the strip of insulation placed over the pipe from its intake point to the end of the car on that side of the coil.

Table 9 presents air temperatures obtained by the Liquidometers and the corresponding resistance thermometers at the top and bottom doorway positions, and the banana temperatures at the doorway obtained by the use of hand thermometers at regular inspection stations. The data shows that the Liquidometer and corresponding resistance thermometer temperatures were in close agreement while the fans were in operation. However when the cars were standing in Winnipeg top air temperatures as indicated by resistance thermometers rose rather rapidly while the Liquidometer temperatures appeared to lag behind. (Cars A,F and G) Top doorway fruit temperatures were nearly identical with top air temperatures while the fans were running but showed a considerable lag upon standing at Winnipeg especially in cars with the portable end bunker heaters. This was probably due to the air temperature being measured at the ceiling while fruit temperatures were taken only 45" from the floor racks considerably below the ceiling position. When air temperatures at the bottom of the load dropped in some of the cars while standing, the fruit in this position remained much higher. In this case the fruit was 10 to 12 inches above the floor rack whereas the air temperature was taken below the floor rack. In general it appears that the air temperatures indicated by the Liquidometer positions at the doorway is very close to the corresponding fruit temperatures at the top and bottom of the load.

SUMMARY OF RESULTS

In general, fruit temperatures in the cars equipped with the underslung heater were very uniform. Some trouble was encountered with the operation of this heater when equipped with a thermostatically controlled valve. However, the manually controlled heater operated satisfactorily and it is believed they will be entirely adequate for use in banana service. Manual control of the heater was based on fruit temperatures obtained at the regular banana service inspection points. Similar control can also be maintained by the use of top and bottom air temperatures as shown by Liquidometer thermometers and use of the Canadian National Railway perishable traffic rules governing the operation of this type of heater. The underslung heater may be serviced and inspected more easily than portable heaters in the bunkers as they may be reached from the ground. No poisonous fumes enter the loading space nor is there danger of accelerated ripening due to ethylene gas in the products of combustion. However, in this test there was no evidence of advanced ripening

in cars using portable heaters in the bunkers. Very satisfactory and uniform temperatures were obtained in the two check cars containing portable charcoal heaters in the bunkers in conjunction with car fans. The fans also were undoubtedly instrumental in maintaining uniform temperatures in the underslung heater cars. Doorway fruit temperatures taken by hand thermometers at inspection points were in close agreement with the Liquidometer readings in practically all cases. Fuel consumption of the portable heaters was considerably less than the underslung heaters.

Acknowledgements

This test was made possible by the following individuals and companies whose cooperation and assistance is gratefully acknowledged.

The Fruit Dispatch Co. for furnishing the loads, and J. N. Kelley, R. B. Tewksbury, and G. C. Dexter of that organization for making the general arrangements for the test.

K. W. Pepperdene, Harold Fuller, and E. Villani, Fruit Dispatch Co. New Orleans for preparation of the test cars and assistance in loading.

Wm. E. Balfrey, Luminator Inc., New York for assistance in preparing the underslung heaters at New Orleans and in unloading at Winnipeg.

The Illinois Central and C.B.& Q. Railroads for furnishing business cars for the accommodation of the test party and for the test cars, and these lines and the Great Northern and Midland Railroads for handling the test train.

W. L. Pennman and W. R. Petsnik, Canadian Banana Co., Winnipeg and Carl H. Geder, Fruit Dispatch Co., Minneapolis, for assistance in unloading.

The members of the test party were:

G. C. Dexter,	Fruit Dispatch Co, New Orleans -	New Orleans	to Winnipeg
K. W. Pepperdene	" "	"	"
J. E. Ballard,	Illinois Central Railroad, Chicago	"	"
H. T. Cook,	U.S.D.A. Beltsville, Md.	"	"
W. H. Redit	" "	"	"
Martin M. Muller,	Fruit Dispatch Co., Mobile Ala.	Fulton Ky.	to Chicago
Henry Meinhardt,	CB&QRR Chicago	E. Dubuque	to Winnipeg
R. W. Tate,	Burlington Refrigerator Express, Chicago	E. Dubuque	to Winnipeg
W. H. Brinkley,	Burlington Refrigerator Exp., La Crosse	"	to La Crosse
T. P. Guthrie,	Fruit Dispatch Co., Minneapolis,	St. Paul	to Winnipeg

Table - 1
Loading Data

	A	B	C	D	E	F	G
Destination	Crescent Fruit Co. Winnipeg	Rogers Fruit Co. Winnipeg	MacDonalds Consolidated, Ltd. Winnipeg	Cran-Mowat-Dever Fruit Co. Winnipeg	Scott Fruit Co. Winnipeg	United Fruit Co. Winnipeg	Sterling Fruit Co. Winnipeg
Variety	Fortuna	Fortuna	Fortuna	Fortuna	Fortuna	Fortuna	Fortuna
Size	Light av nines	Light av nines	Light av nines	Light av nines	Light av. nines	Light av nines	Light av nines
No. Stems	291	281	281	268	285	298	286
Av. Weight (lbs.)	67.5	70.4	70.2	74.2	67.5	65.2	68.4
Stems-top layer	12 & 12	13 & 13	13 & 14	12 & 12	12 & 12	14 & 12	12 & 12
Load Weight (Net-lbs.	19,670	19,790	20.370	19.910	19.250	19.450	19.570
Loading-begun	4:45 PM	6:30 PM	6:00 PM	4:45 PM	5:50 PM	6:45 PM	9:30 PM
-finished	5:45 PM	8:35 PM	6:45 PM	6:00 PM	6:40 PM	9:20 PM	10:30 PM
Ave. fruit temp.	54°	54°	54°	54°	54°	54°	54°
Ave. outside Air Temp.	66°	69°	69°	67°	68°	67°	64°

Table No. 2

Corrected Air and Commodity Temperatures

Commodity Bananas

Car No. A IC-50493
HEATER-THERMOSTATICALLY CONTROLLED UNDERSLUNG HEATER

Station	Date Feb.	Time	OST °F	Top Air (1)	Bot. Air (1)	TBCL H	TQCL H	TQCL R	TBCL R	BBCL H	BBES H	BOT. intake	BOT. return	BBES R	BBCL R	MAX	MIN	AVE TOPS	AVE BOTT
Loaded - Feb. 13 - 4:45 - 5:45PM																			
New Orleans	14	3A	58°	615	580	615	605	610	605	575	575	565	565	570	570	61.5	56.5	60.9	57.0
Both rear vents opened 2" on irons at New Orleans																			
Hammond	14	11AM	55°	595	585	600	590	590	585	585	590	675	575	580	580	67.5	57.5	59.1	59.7
JacksonMiss	14	4:30P	415	580	580	595	585	575	570	585	585	575	575	570	580	67.5	57.0	58.1	57.8
Memphis	15	4AM	32	550	555	565	560	540	530	565	565	550	550	540	545	56.5	53.0	54.9	55.2
Vents closed at Memphis																			
Fulton Ky.	15	11AM	34	545	555	590	550	545	540	555	555	550	545	540	540	59.0	54.0	55.6	54.7
Bluford Ill.	15	10P	30	545	555	580	550	540	540	555	555	550	540	550	545	58.0	54.0	55.2	54.9
Champaigne	16	9:30A	28	535	535	585	540	535	530	550	540	540	545	540	540	58.5	53.0	54.7	54.2
Chicago	16	1P	30	530	540	545	535	535	530	545	540	540	540	535	535	54.5	53.0	53.6	53.9
Heater lit at Chicago 2:00PM																			
E. Dubuque	17	6A	0	520	535	570	525	520	520	530	525	530	535	525	525	57.0	52.0	53.4	52.8
La Crosse	17	1P	30	520	535	560	530	520	520	535	530	530	530	525	525	56.0	52.0	53.2	52.9
St.PaulMinn.	17	6P	32	515	525	555	515	510	525	520	520	520	520	515	515	55.5	51.0	52.6	51.8
Fargo,N.D.	18	9A	-5	505	530	540	515	515	510	525	520	520	520	520	515	54.0	51.0	52.0	52.0
Grand Forks	18	2P	0	510	530	530	520	510	510	520	520	520	520	515	515	53.0	51.0	51.7	51.8
2 Portable heaters lit - 1 each bunker - 2PM Grand Forks																			
Noyes	19	1A	-4	610	540	610	585	575	580	585	565	545	545	545	540	61.0	54.5	58.7	55.4
Rear heater removed at Noyes 2AM																			
Winnipeg	19	8A	-14	660	540	585	570	585	585	565	550	550	555	560	565	58.5	55.0	58.1	55.7
	19	4P	+5°	645	525	605	585	600	600	545	545	545	560	570	570	60.5	54.5	59.7	55.6
	20	7A	10	600	515	620	585	605	600	540	555	550	560	575	570	62.0	54.0	60.2	55.8
Unloaded 8AM																			

(1) Resistance thermometers adjacent to Liquidometer bulb.

Table No. 3

Corrected Air and Commodity Temperatures

Commodity Bananas

Car No. B IC-50357
HEATER-THERMOSTATICALLY CONTROLLED UNDERSLUNG HEATER

Station	Date Feb.	Time	OST °F.	Top Air (1)	Bot Air (1)	TBCL H	TQCL H	TQCL R	TBCL R	BBCL H	BBES H	BOT. intake	BOT. return	BBES R	BBCL R	MAX.	MIN.	AVE. TOPS	AVE. BOTT.
Loaded Feb. 13 6:30 - 8:35PM																			
New Orleans	14	3A	58°	630	600	615	615	615	620	580	615	560	550	575	585	61.5	55.0	61.6	57.7
Hammond	14	11A	55°	610	600	600	600	590	605	590	595	680	565	585	595	68.0	56.5	59.9	60.2
Both rear vents opened 2" on irons at New Orleans																			
Jackson Miss.	14	4:30P	415°	600	595	595	590	580	585	590	595	580	565	575	585	59.5	56.5	58.7	58.2
Memphis	15	4A	32	560	545	560	560	545	545	575	570	565	545	535	560	57.5	53.5	55.2	55.8
Fulton	15	11A	34	555	555	565	550	550	550	560	560	555	540	550	560	56.5	54.0	55.8	55.4
Vents Closed at Memphis																			
Bluford, Ill.	15	10P	30	555	555	550	550	550	555	555	560	555	540	555	560	56.0	54.0	55.1	55.4
Champaigne	16	9:30A	28	545	535	540	540	540	545	445	555	545	535	545	555	55.5	53.5	54.1	53.0
Chicago	16	1P	30	540	540	535	535	535	545	540	550	545	530	545	555	55.5	53.5	53.7	56.1
E. Dubuque	17	6A	0	555	555	550	550	555	560	555	555	550	545	560	560	56.0	54.5	55.4	55.4
Heater lit at Chicago - 2PM																			
N.La Crosse	17	1P	30	560	560	555	555	560	565	560	560	555	550	560	565	56.5	55.0	55.9	55.8
St. Paul	17	6P	32	565	560	555	555	560	565	555	560	555	545	560	565	56.5	54.5	55.9	55.7
Fargo N.D.	18	9A	-5	560	580	565	565	565	570	585	570	565	555	570	580	58.5	56.5	56.6	57.1
Grand Forks	18	2P	0	565	580	560	560	565	570	580	570	560	555	570	580	58.0	55.5	56.4	56.9
Noyes	19	1A	-4	550	575	555	555	550	560	--	570	555	545	555	570	57.0	54.5	55.5	55.9
Winnipeg	19	8A	-14	545	550	545	550	545	555	555	565	545	540	550	565	56.5	54.5	54.9	55.3
		4P	+5	540	525	535	545	540	550	535	540	535	530	540	545	54.5	53.0	54.2	53.7
	20	7A	10	550	535	535	540	540	550	540	530	535	545	530	530	55.0	53.0	54.1	57.7
Unloaded 11:25A - 3:20PM																			

(1) Resistance themometers adjacent to liquidometer bulbs.

Table No. 4

Corrected Air and Commodity Temperatures

Commodity Bananas

Car No. C IC-50470
HEATER - CHECK CAR -1-KLAUER BANANA HEATER IN BUNKERS

Station	Date Feb.	Time	OST °F.	Top Air (1)	Bot. Air (1)	TBCL H	TQCL H	TQCL R	TBCL R	BBCL H	BBES H	BOT. intake	BOT. return	BBES R	BBCL R	MAX	MIN	AVE. TOPS	AVE. BOTT.
Loaded Feb. 13 6:00 6:45PM																			
New Orleans	14	3A	58	620	605	615	615	610	625	585	575	585	565	570	580	62.5	56.5	61.6	57.7
Both Rear Vents Opened 2" on irons at New Orleans																			
Hammond	14	11A	55°	600	615	600	600	590	610	590	590	620	585	575	590	62.0	57.5	60.0	59.2
Jackson	14	4:30P	45°	590	590	585	595	585	575	590	590	605	585	570	580	60.5	57.0	58.5	58.7
Memphis	15	4AM	32	565	555	560	565	550	530	575	570	610	565	540	550	61.0	53.0	55.1	56.8
Vents Closed at Memphis																			
Fulton	15	11A	34	555	565	555	560	550	540	565	560	560	555	540	550	56.5	54.0	55.1	55.5
Bluford	15	10P	30	555	570	555	560	550	550	565	560	560	555	550	555	56.5	55.0	55.4	55.7
Champaign	16	9:30	28	545	560	540	565	545	540	550	555	555	550	545	550	56.5	54.0	54.7	55.1
Chicago	16	1P	30	540	565	535	545	545	540	550	550	555	550	540	550	55.5	53.5	54.1	54.9
Heater Lit at Chicago 2 PM																			
Dubuque	17	6A	0	590	570	545	555	565	570	545	550	565	555	560	580	58.0	54.5	55.9	55.0
La Crosse	17	1P	30	600	560	550	555	570	575	550	550	585	560	565	590	59.0	55.0	56.2	56.[illegible]
St. Paul	17	6P	32	590	560	545	550	565	570	545	540		555	560	580	58.0	54.0	55.7	56.6
Fargo	18	9A	-5	605	570	555	560	585	585	555	555	565	585	580	605	60.5	55.5	57.1	57.4
Gd. Forks	18	2P	0	590	565	550	555	585	585	555	555	565	585	575	605	60.5	55.0	56.9	57.3
Noyes	19	1A	-4	580	560	545	550	570	575	550	545	560	570	570	595	59.5	54.5	56.0	56.5
Winnipeg	19	8A	-14	580	550	545	550	570	570	545	545	550	565	565	585	58.5	54.5	55.9	55.9
	19	4P	+5°	590	530	550	555	575	575	530	540	545	555	555	555	57.5	53.0	56.4	54.7
	20	7A	10	570	520	545	555	570	570	525	530	555	545	540	535	57.0	52.5	56.0	53.8
Unloaded 7:30AM																			

(1) Resistance thermometers in position similar to liquidometer bulbs in other cars.

Table No. 5

Corrected Air and Commodity Temperatures

Commodity Bananas

Car No. D IC 50437
HEATER-MANUALLY CONTROLLED UNDERSLUNG HEATER

tation	Date Feb.	Time	OST °F.	Top Air (1)	Bot Air (1)	TBCL H	TQCL H	TQCL R	TBCL R	BBCL H	BBES H	BOT. intake	BOT. return	BBES R	BBCL R	MAX.	MIN.	AVE. TOPS	AVE. BOTT.
								Loaded Feb. 13 4:45 - 6:00PM											
New Orleans	14	3A	58°	615	595	615	615	615	610	585		570	565	670	575	61.5	56.5	61.4	59.3
								Both Rear Vents Opened 2" on irons at New Orleans											
Hammond	14	11A	55°	590	595	600	600	600	590	590		580	570	585	580	60.0	57.0	59.7	58.1
Jackson	14	4:30P	415	580	580	590	595	585	580	590		580	570	580	575	59.5	57.0	58.7	57.9
Memphis	15	4A	32	555	540	560	565	560	535	565		570	555	550	545	57.0	53.5	55.5	55.7
								Vents Closed At Memphis											
Fulton	15	11A	34	545	555	555	560	550	545	555		560	545	550	545	56.0	54.5	55.2	55.1
Bluford	15	10P	30	545	555	550	560	555	550	555		575	550	560	545	56.0	54.5	55.4	55.7
Champaign	16	9:30A	28	530	525	540	550	545	540	545		555	540	555	540	55.5	54.0	54.4	54.7
Chicago	16	1P	30	525	540	540	550	540	535	545		555	535	550	535	55.5	53.5	54.1	54.4
								Heater Lit at Chicago											
Dubuque	17	6A	0	530	550	545	550	545	545	550		555	535	550	545	55.5	53.5	54.6	54.5
La Crosse	17	1P	0	535	550	545	555	550	545	550		555	540	555	540	55.5	54.0	54.9	54.8
St. Paul	17	6P	32	540	540	545	550	550	540	545		545	530	550	535	55.0	53.5	54.6	54.1
Fargo	18	9A	-5	540	560	555	565	560	555	565		560	550	560	530	56.5	53.0	55.9	55.3
Gr. Forks	18	2P	0	545	555	555	565	555	550	560		560	550	565	550	56.5	55.0	55.6	55.7
Noyes	19	1A	-4	545	555	555	560	555	545	565		555	550	560	545	56.5	54.5	55.4	55.5
Winnipeg	19	8A	-14	540	565	555	565	555	540	560		560	555	555	540	56.5	54.0	55.4	55.4
	19	4P	+5°	550	545	555	565	555	545	545		560	555	539	530	56.5	53.0	55.5	54.6
	20	7A	10	550	555	550	570	560	545	540		565	565	535	525	57.0	52.5	55.6	54.6
								Unloaded 7:30AM											

(1) Resistance thermometers adjacent to Liquidometer bulb.

Table No. 6

Corrected Air and Commodity Temperatures

Commodity Bananas

Car No. E IC-50441
HEATER - CHECK CAR -1 KLAUER BANANA HEATER IN BUNKER

Station	Date Feb.	Time	OST °F.	Top Air (1)	Bot. Air (1)	TBCL H	TQCL H	TQCL R	TBCL R	BBCL H	BBES H	BOT. intake	BOT. return	BBES R	BBCL R	MAX.	MIN.	AVE. TOPS	AVE. BOTT.
Loaded Feb. 13 5:50 - 6:40PM																			
New Orleans	14	3A	58	635	600	625		620	615	590	575		580	580	585	62.5	57.5	62.0	58.2
Both Rear Vents opened 2" on irons at New Orleans																			
Hammond	14	11A	55°	615	600	610		595	600	600	595		590	585	595	61.0	58.5	60.1	59.3
Jackson	14	4:30P	415	610	590	605		585	575	600	595		585	575	590	60.5	57.5	58.8	59.0
One Vent Closed at Memphis																			
Memphis	15	4A	32	570	540	575		545	530	575	570		560	535	550	57.5	53.0	55.0	55.8
Both Vents Closed Fulton																			
Fulton	15	11A	34	560	555	560		540	530	560	555		545	535	545	56.0	53.0	54.3	54.8
Bluford	15	10P	30	560	555	560		545	535	560	555		550	545	550	56.0	53.5	54.7	55.2
Champaign	16	9:30A	28	550	540	545		540	530	550	545		545	540	545	55.0	53.0	53.8	54.5
Chicago	16	1P	30	550	545	545		535	525	550	540		540	540	540	55.0	52.5	53.5	54.2
Heater Lit at Chicago 2PM																			
Dubuque	17	6A	0	610	545	555		560	560	550	545		560	555	570	57.0	54.5	55.8	55.6
La Crosse	17	1P	30	630	550	560		570	565	555	550		560	560	580	58.0	55.0	56.5	56.1
St. Paul	17	6P	32	620	550	560		575	570	545	545		560	665	585	58.5	54.5	56.8	58.0
Fargo	18	9A	-5	620	565	570		590	580	565	560		585	585	605	60.5	56.0	58.0	58.0
Gr. Forks	18	2P	0	610	565	565		590	580	560	560		585	580	605	60.5	56.0	57.8	57.8
Noyes	19	1A	-4	605	555	560		580	575	555	555		575	610	600	61.0	55.5	57.2	57.9
Winnipeg	19	8A	-14	615	545	560		585	570	550	555		570	565	595	59.5	55.0	57.2	56.7
	19	4P	+5°	615	520	565		590	580	540	545		560	550	565	59.0	54.5	57.8	55.2
	20	7A	10°	600	505	560		585	575	535	545		555	545	550	58.5	53.5	57.5	54.6
Unloaded 7:30AM																			

(1) Resistance thermometers in position similar to liquidometer bulbs in other cars.

Table No. 7

Corrected Air and Commodity Temperatures

Commodity Bananas

Car No. F-BREX 74398
HEATER-MANUALLY CONTROLLED UNDERSLUNG HEATER

Station	Date Feb.	Time	OST °F.	Top Air (1)	Bot. Air (1)	TBCL H	TQCL H	TQCL R	TQCL R	BBCL H	BBES H	BOT. intake	BOT. return	BBES R	BBCL R	MAX	MIN	AVE TOPS	AVE. BOTT
Loaded Feb. 13 6:45 - 9:20PM																			
New Orleans	14	3A	58	620	595	620	615	610	620	565	585	570	570	585	590	62.0	56.5	61.6	57.7
Both rear vents open 2" on irons at New Orleans																			
Hammond	14	11A	55	590	590	595	600	590	590	575	615	580	585	590	590	61.5	57.5	59.3	59.2
Jackson, Miss.	14	4:30P	41	580	575	580	585	670	575	560	590	575	575	570	570	59.0	56.0	60.2	57.3
Memphis	15	4A	32	540	530	545	550	525	525	540	555	540	545	530	525	55.5	52.5	53.6	53.9
Both vents closed at Memphis																			
Fulton	15	11A	34	535	530	535	540	530	525	525	545	530	535	535	530	54.5	52.5	53.2	53.3
Bluford	15	10P	30	530	525	535	540	525	525	520	540	535	535	535	535	54.0	52.5	53.1	53.3
Champaign	16	9:30A	28	520	500	520	525	545	515	505	525	525	520	520	520	54.5	51.5	52.6	51.9
Chicago	16	1P	30	515	510	515	520	510	510	500	520	520	515	515	515	52.0	51.0	51.4	51.4
Heater lit at Chicago -2PM																			
E. Dubuque	17	6A	0	505	495	515	520	510	505	495	520	510	520	515	515	52.0	49.5	51.2	51.1
La Crosse	17	1P	30	525	515	530	540	520	515	505	525	520	550	525	525	55.0	50.5	52.6	52.5
St. Paul	17	6P	32	540	520	540	550	540	530	505	535	525	545	540	535	55.0	50.5	54.0	53.1
Fargo	18	9A	-5	525	515	530	540	525	525	515	545	530	540	535	530	54.5	51.5	53.0	53.2
Grand Forks	18	2P	0	525	520	530	540	525	520	510	540	530	545	530	530	54.5	51.0	52.9	53.1
Portable heater installed in rear bunker at Noyes (2)																			
Noyes	19	1A	-4	520	515	525	535	520	515	505	535	525	555	525	525	55.5	50.5	52.4	52.8
Winnipeg	19	8A	-14	710	540	570	575	580	580	515	540	545	570	550	570	58.0	51.5	57.6	54.8
	19	4P	5	680	540	585	595	595	600	515	540	550	590	570	575	60.0	51.5	59.4	55.9
Portable heater removed - 5PM																			
	20	7A	10	580	560	580	590	575	580	525	550	575	660	570	555	66.0	52.5	58.1	57.2
Unloaded 9AM																			

(1) Resistance thermometers adjacent to liquidometer bulb.

(2) Actually in forward end of car at same time as cars were reversed at Chicago.

Table No. 8

Corrected Air and Commodity Temperatures

Commodity Bananas

Car No. G BREX 74399
HEATER - MANUALLY CONTROLLED UNDERSLUNG HEATER

Station	Date Feb.	Time	OST °F.	Top Air (1)	Bot Air (1)	TBCL H	TQCL H	TQCL R	TBCL R	BBCL H	BBES H	BOT intake	BOT return	BBCS R	BBCL R	MAX.	MIN.	AVE. TOPS	AVE. BOT.
Loaded Feb. 13 9:30 - 10:30PM																			
New Orleans	14	3A	58	615	595	605	605	605	605	570	575	570	560	545	580	60.5	57.0	60.5	56.7
Both Rear Vents opened 2" on irons at New Orleans																			
Hammond	14	11A	55	590	585	585	590	585	600	580	575	580	570	765	580	76.5	57.0	59.0	60.8
Jackson	14	4:30P	415	580	575	575	575	575	565	575	575	575	570	615	580	61.5	57.5	57.2	58.2
Memphis	15	4A	32	545	540	540	555	540	525	550	550	560	550	545	545	56.0	52.5	54.0	55.0
Both Vents Closed at Memphis																			
Fulton	15	11A	34	540	540	565	540	540	530	540	540	545	535	555	545	56.5	53.0	54.4	54.3
Bluford	15	10P	30	540	540	540	545	540	530	540	545	545	540	555	545	55.5	53.0	53.9	54.5
Champaign	16	9:30A	28	530	520	520	530	530	520	525	530	535	530	550	535	55.0	52.0	52.5	53.4
Chicago	16	1P	30	530	520	525	525	525	515	520	520	530	525	545	530	54.5	51.5	52.2	52.8
Heater lit at Chicago																			
Dubuque	17	6A	0	520	515	520	525	520	520	520	520	540	525	550	530	55.0	52.0	52.1	53.1
La Crosse	17	1P	30	540	525	540	540	530	540	530	530	570	550	570	555	57.0	53.0	53.7	55.1
St. Paul	17	6P	32	560	530	550	550	545	550	535	535	585	550	575	555	58.5	53.5	54.9	55.6
Fargo	18	9A	-5	545	545	545	550	545	540	550	550	580	560	560	560	58.0	54.5	54.5	56.0
Gr. Forks	18	2P	0	550	545	545	550	545	545	545	550	580	560	560	550	58.0	54.5	54.6	55.1
Noyes	19	1A	-4	550	540	550	550	545	540	545	550	590	590	565	550	59.0	54.0	54.6	56.5
Winnipeg	19	8A	-14	560	530	545	550	540	535	545	550	595	600	555	545	60.0	53.5	54.2	56.5
	19	4P	5	565	520	550	555	545	540	540	550	625	615	540	540	62.5	54.0	54.7	56.5
	20	7A	10	570	525	555	555	555	545	545	550	615	610	545	545	61.5	54.5	55.2	56.8

(1) Resistance Thermometers adjacent to Liquidometer bulb.

Table No. 9

Comparison of Thermometers (1) Used With Average Top and Bottom Commodity Temperatures

Station	Car A-IC 50493						Car B-IC 50357						Check Car Car C-IC 50470						Manually installed Car D-IC 50437					
	Liquidometer		Resis. Thermo.		Pulp		Liquidometer		Resis. Thermo.		Pulp		Resis. Rhermo.		Pulp		Liquidometer		Resis. Thermo.		Pulp	
	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.
New Orleans	62	59	61.5	58.0	60	59	64	60	63.0	60.0	61	59	62.0	60.5	61	60	62	60	61.5	59.5	60	59
Jackson	59	59	58.0	58.0	58	58	60	60	60.0	59.5	59	60	59.0	59.0	59	60	59	59	58.0	58.0	60	60
Memphis	55	55	55.0	55.5	55	56	56	56	56.0	54.5	56	56	56.5	55.5	56	56	56	56	55.5	54.0	56	56
Fulton	55	55	54.5	55.5	55	55	55	56	55.5	55.5	56	56	55.5	56.5	56	56	55	55	54.5	55.5	56	56
Bluford	54	55	54.5	55.5	55	55	54	55	55.5	55.5	55	56	55.5	57.0	55	56	54	56	54.5	55.5	55	55
Chicago	52	53	53.0	54.0	54	54	53	54	54.0	54.0	54	55	54.0	56.5	55	55	52	54	52.5	54.0	54	55
E.Dubuque	52	53	52.0	53.5	52	52	54	56	55.5	55.5	55	56	59.0	57.0	55	54	53	55	53.0	55.0	55	55
St. Paul	52	53	51.5	52.5	53	53	56	57	56.5	56.0	57	60	59.0	56.0	56	56	54	56	54.0	54.0	55	56
Fargo	51	53	50.5	53.0	52.5	52.5	55	58	56.0	58.0	58	58	60.5	57.0	57	57	54	57	54.0	56.0	57	57
Grand Forks	50	52	51.0	53.0	52	52	54	58	56.5	58.0	56	57	59.0	56.5	56	56	53	56	54.5	55.5	55	56
Noyes	58	54	61.0	54.0	57	55	54	57	55.0	57.5	56	57	58.0	56.0	56	56	54	57	54.5	55.5	56	56
Winnipeg	60	54	66.0	54.0	57	56	54	56	54.5	55.0	55	55	58.0	55.0	55	55	53	54	54.0	56.5	55	55
	62	52	64.5	52.5	58	56	54	54	54.0	52.5	57	56	59.0	53.0	56	56	54	56	55.0	54.5	56	56
	61	51	60.0	51.5	59	56	--	--	55.0	53.5	56	56	57.0	52.0	55	55	54	56	55.0	55.5	56	56

(1) Air temperatures shown by liquidometers and resistance thermometers at the liquidometer bulb positions, and pulp temperature of fruit at the doorway as determined by hand thermometers.

Cont. Table 9

Station	Check Car Car E IC 50441				Car F BRE 74398						Car G BRE 74399					
	Resis. Thermo.		Pulp		Liquidometer		Resis. Thermo.		Pulp		Liquidometer		Resis Thermo.		Pulp	
	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.
New Orleans	63.5	60.0	61	60	60	61	62.0	59.5	60	58	62	60	61.5	59.5	60	58
Jackson	61.0	59.0	60	60	58	58	58.0	57.5	59	59	58	58	58.0	57.5	58	58
Memphis	57.0	54.0	57	57	54	54	54.0	53.0	55	55	54	53	54.5	54.0	54	55
Fulton	56.0	55.5	56	56	54	53	53.5	53.0	54	54	54	54	54.0	54.0	55	55
Bluford	56.0	55.5	55	55	53	52	53.0	52.5	52	52	53	53	54.0	54.0	54	55
Chicago	55.0	54.5	54	54	51	51	51.5	51.0	52	52	52	52	53.0	52.0	53	53
E. Dubuque	61.0	54.5	55	55	49	49	50.5	49.5	51	51	50	50	52.0	51.5	51	52
St. Paul	62.0	55.0	57	56	54	52	54.0	52.0	55	55	54	53	56.0	53.0	56	57
Fargo	62.0	56.5	57	57	51	51	52.5	51.5	54	54	53	53	54.5	54.5	55	56
Grand Forks	61.0	56.5	57	57	52	52	52.5	52.0	53	53	53	53	55.0	54.5	55	55
Noyes	60.5	55.5	56	57	51	51	52.0	51.5	53	53	53	53	55.0	54.0	55	55
Winnipeg	61.5	54.5	55	56	64	52	71.0	54.0	56	55	52	52	56.0	53.0	54	55
	61.5	52.0	57	56	67	53	68.0	54.0	58	57	54	52	56.5	52.0	56	56
	60.0	50.5	56	56	--	--	58.0	56.0	--	--	54	51	57.0	52.5	57	57

Table No. 10

HEATER INSPECTION DATA

Test Code No. A Thermostat Setting 55° Heater Luminator-Mitchel
Car No. IC-50493 Fans On Drains Plugged Placement Underslung

Inspected at	Date Feb.	Time	OST °F. 5/	Temp. Doorway pulp Top	Bot.	Burner Operation under-slung	Port-able	Fuel added	Fuel in Heater	Remarks
Chicago	16	2P	30°	54	54	Lit			60 lbs.	Draft set at 6
E. Dubuque	17	6A	0°	52	52	B 3/				Reset Thermostat to 60°
St. Paul	17	6P	28°	53	53	B		20 lbs.		Reset Draft to 4
Fargo	18	9A	-5°	52.5	52.5	B				Reset Thermostat to 70° Reset Draft to 7
Grand Forks	18	2P	0°	52	52	B				Close off under-slung Install 2 port. 1 ea. end(1)
Noyes	19	1A	-4°	57	55	D 4/	B			Remove rear heat-er (2)
Winnipeg	19	4P	5°	58	56	D	B	15 lbs.		to portable heat-er
	20	7A	10°	59	56	D	B		25 lbs. (underslung) no record portable	10 AM unloading inspection

Estimated total fuel consumed - 70 lbs. (both heaters)

(1) Simplex 1 piece - Fast draft

(2) No record of fuel consumed on heater removed.

(3) Burning

(4) Dark

(5) Outside temperature

Table No. 11

HEATER INSPECTION DATA

Test Code No. B
Car No. IC-50357

Thermostat Setting 55°
Fans On Drains Plugged

Heater Luminator-Mitchel
Placement Underslung

Inspected at	Date Feb.	Time	OST °F. 3/	Temp. Doorway pulp Top	Temp. Doorway pulp Bot.	Burner Operation	Fuel added	Fuel in heater	Remarks
Chicago	16	2P	30°	54	55	Lit		60 lbs.	Draft set at 6
E. Dubuque	17	6A	0°	55	56	B 2/			OK
St Paul	17	6P	28°	57	60	B	20 lbs.		Reset Thermostat to 50°(1) Reset Draft to 4
Fargo	18	9A	-5°	58	58	B			OK
Grand Forks	18	2P	0°	56	57	B	40 lbs.		OK
Winnipeg	19	6A	-14°	55	55	B			OK
	19	4P	+5°	57	56	B			Reset draft to 7
	20	7A	10°	56 1/2	56	B		40 lbs.	10 AM Unloading inspection

Estimated total fuel consumed 80 lbs.

Notes (1) Reset to 50° as Thermo suspected of being 5° off when checked at New Orleans.

(2) Burning

(3) Outside temperature

Table No. 12

HEATER INSPECTION DATA

Test Code No. C Thermostat Setting _____ Heater Klauer-small-039
Car No. IC-50470 Fans On Drains Plugged Placement Bunkers (Hd.End)(1)

Inspected at	Date Feb.	Time	OST 3/ °F.	Temp. Doorway pulp Top	Bot.	Burner Operation	Fuel added	Fuel in heater	Remarks
Chicago	16	2P	30	55	55	Lit		20 lbs.	Full-Fast draft
E. Dubuque	17	6A	0°	55	54	B 2/		15	OK
St. Paul	17	6P	28°	56	56	B	8 lbs.	12	OK
Fargo	18	9A	-5°	57	57	B	-	-	OK
Grand Forks	18	2P	0°	56	56	B	3	17	OK
Winnipeg	19	4P	+5°	56	56	B	15	-5	OK
	20	7A	10	55	55	B		19	10 AM unloading inspection

Est. Total fuel consumed - 27 lbs.

Notes (1) Cars turned at Chicago. Heater placed in bunker designated "rear" on temperature table.

(2) Burning

(3) Outside temperature

Table No. 13

HEATER INSPECTION DATA

Test Code No. D Thermostat Setting None Heater Luminator-Mitchel(Manual)
Car No. IC-50437 Fans On Drains Plugged Placement Underslung

Inspected at	Date Feb.	Time	OST 2/ °F.	Temp. Doorway pulp Top	Bot.	Burner Operation	Fuel added	Fuel in heater	Remarks
Chicago	16	2P	30	54	55	Lit		60 lbs.	Draft-2
E. Dubuque	17	6A	0°	55	55	B 1/			OK
St. Paul	17	6P	28°	56	56	B	20 lbs.		OK
Fargo	18	9A	-5	57	57	B			OK
Grand Forks	18	2P	0°	55	56	B	30 lbs.		Draft reset to 4
Winnipeg	19	4P	+5	56 1/2	56 1/2	B			Draft reset to 6
	20	7A	10	56 1/2	56 1/2	B		40 lbs.	10 AM unloading inspection

Estimated total fuel consumed - 70 lbs.

Notes (1) Burning

(2) Outside temperature

Table No. 14

HEATER INSPECTION DATA

Test Code No. E — Thermostat Setting None — Heater Klauer-Baxter(small)039
Car No. IC-50441 — Fans On — Drains Plugged — Placement Bunker (Hd. end)(1)

Inspected at	Date Feb.	Time	OST 3/ °F.	Temp Doorway pulp Top	Bot.	Burner Operation	Fuel added	Fuel in heater	Remarks
Chicago	16	2P	30	54	54	Lit		20 lbs.	Full-Fast draft
E. Dubuque	17	6A	0°	55	55	B 2/		15	OK
St. Paul	17	6P	28	57	56	B	8 lbs.	12	OK
Fargo	18	9A	-5	57	57	B	-	-	OK
Grand Forks	18	2P	0°	57	57	B	3	17	OK
Winnipeg	19	4P	+5°	57	56	B	15	5	OK
	20	7A	10°	56	56	B	-	18	10 AM unloading inspection

Estimated total fuel consumed - 25 lbs.

Notes (1) Cars turned at Chicago. Heater placed in bunker designated "rear" in temperature tables.

(2) Burning

(3) Outside temperature

Table No. 15

HEATER INSPECTION DATA

Test Code No. F Thermostat Setting None Heater Luminator-Mitchel(Manual)
Car No. BRE 74398 Fans On Drains Plugged Placement Underslung

Inspected at	Date Feb.	Time	OST 3/ °F.	Temp. Doorway pulp Top	Temp. Doorway pulp Bot.	Burner Operation Underslung	Burner Operation Portable	Fuel added Underslung	Fuel added Portable	Fuel in heater Underslung	Fuel in heater Portable	Remarks
Chicago	16	2P	30	52	52	Lit		-		60 lbs.		Damper set at 2
E. Dubuque	17	6A	0°	51	51	B 2/		-		-		Draft reset to 6
St. Paul	17	6P	28°	55	55	B		20 lbs.		-		Draft reset to 2
Fargo	18	9A	-5	54	54	B		-		-		Draft reset to 6
Grand Forks	18	2P	0°	53 1/2	53 1/2	B		40lbs.				Draft reset to 7
Noyes	19	1A	-4°	53	53	B		-			20 lbs.	Draft OK installed(1) one heater in head bunker
Winnipeg	19	4P	+5	58	57	B	B	20 lbs.				Draft OK at 7 Remove portable heater
	20	7A	10	56	54	B				30 lbs.		10 AM unloading inspection

Estimated total fuel consumed 110 lbs (underslung heater)
Fuel consumed by portable unknown

(1) Simplex one piece heater-full burning-as cars were turned at Chicago heater placed in bunker designated "rear" in temperature tables.

(2) Burning

(3) Outside temperature

Table No. 16

HEATER INSPECTION DATA

Test Code No. G
Car No. BRE 7439

Thermostat Setting None
Fans On Drains Plugged

Heater Luminator-Mitchel(manual)
Placement Underslung

Inspected at	Date Feb.	Time	OST 2/ °F.	Temp. Doorway pulp Top	Bot.	Burner Operation	Fuel added	Fuel in heater	Remarks
Chicago	16	2P	30	53	53	Lit		60 lbs.	Damper set at 2
E. Dubuque	17	6A	0°	51	52	B 1/			Draft reset to 6
St. Paul	17	6P	28°	56	57	B	20 lbs.		Draft reset to 2
Fargo	18	9A	-5	55	56	B			Draft reset to 4
Grand Forks	18	2P	0°	55	55	B	40 lbs.		Draft reset to 6
Winnipeg	19	4P	+5°	56	56	B	20 lbs.		Draft reset to 7
	20	7A	10	57	57	B		40 lbs.	9 AM unloading inspection

Estimated total fuel consumed 100 lbs.

Notes (1) Burning

(2) Outside temperatures

Fig. 1

OUTSIDE AIR TEMPERATURE
70°
60°
50°
40°
30°
20°
10°
0°
-10°
-20°
Feb. 13
14
15
16
17
18
19
20
New Orleans
New Orleans
Jackson, Miss.
Memphis, Tenn.
Fulton, Ky.
Bluford, Ill.
Champaigne
Chicago
E. Dubuque
St. Paul, Minn.
Fargo, N. D.
Grand Forks
Noyes, Minn.
Winnipeg
Winnipeg

Fig. 2

CAR A IC50493
THERMOSTATICALLY CONTROLLED
UNDERSLUNG HEATER

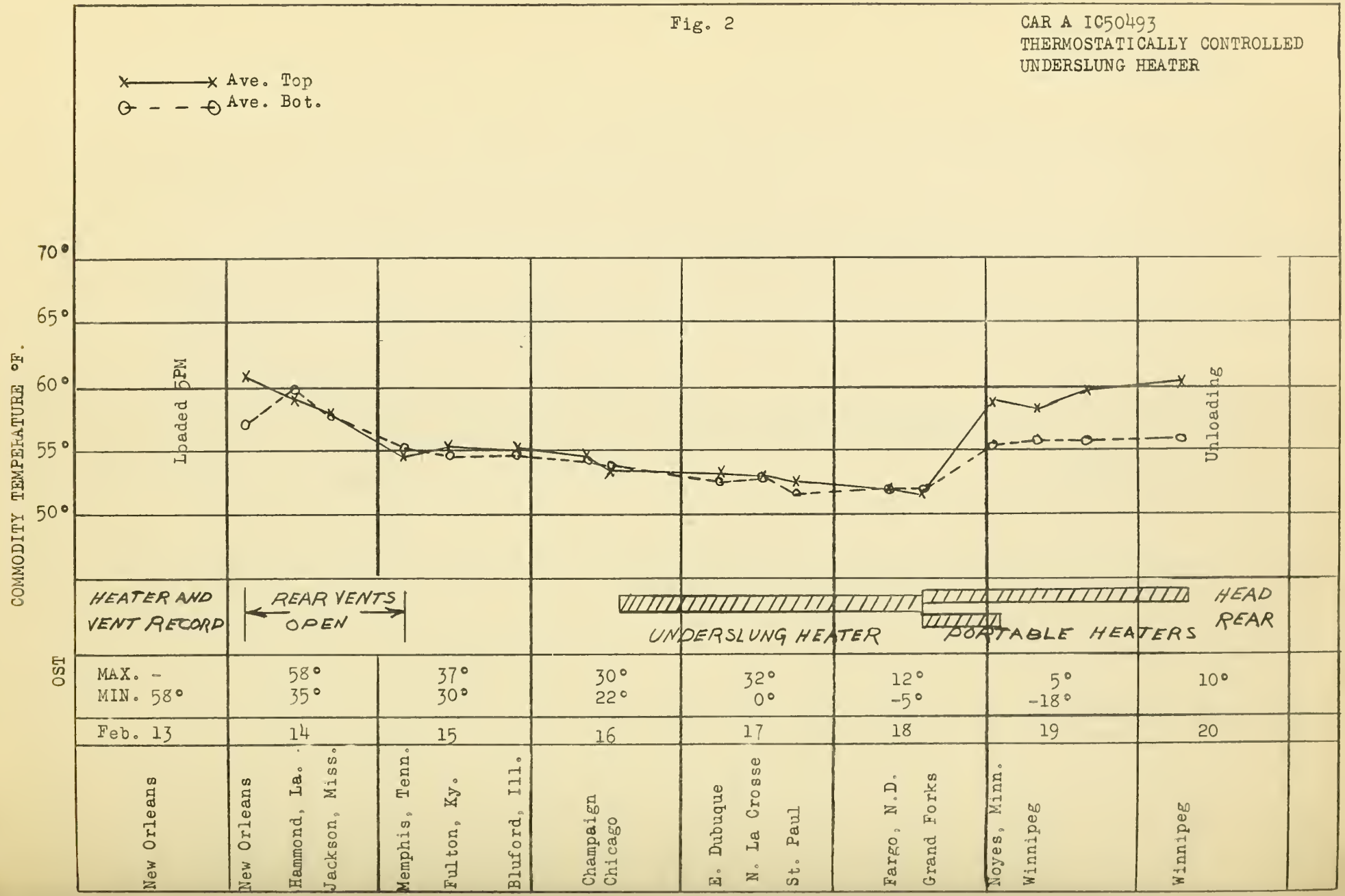
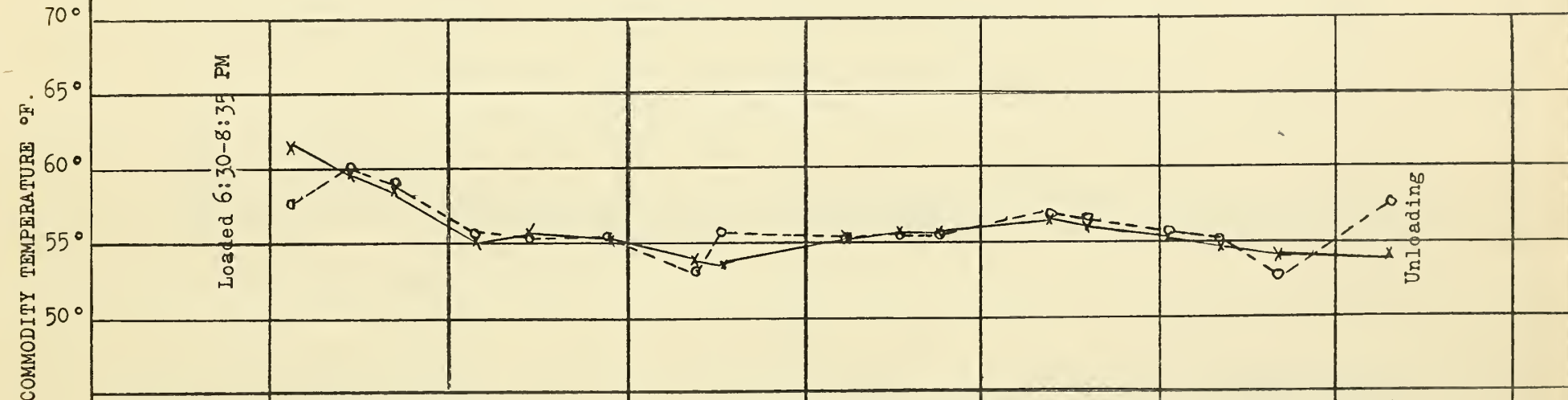


Fig. 3

CAR B IC-50357
THERMOSTATICALLY
CONTROLLED CHARCOAL
HEATER (UNDERSLUNG)



HEATER AND VENT RECORD	REAR VENTS OPEN			UNDERSLUNG HEATER				
OST MAX. - / MIN. 58°	58° / 35°	37° / 30°	30° / 22°	32° / 0°	12° / -5°	5° / -18°	10°	
Feb. 13	14	15	16	17	18	19	20	
New Orleans	New Orleans Hammond, La. Jackson, Miss	Memphis, Tenn Fulton, Ky. Bluford, Ill.	Champaign Chicago	E. Dubuque N. La Crosse St. Paul	Fargo, N.D. Grand Forks	Noyes, Minn. Winnipeg	Winnipeg	

Fig. 4

CAR C-1050470
CHECK CAR
1 KLAUER BANANA HEATER
IN HEAD BUNKER

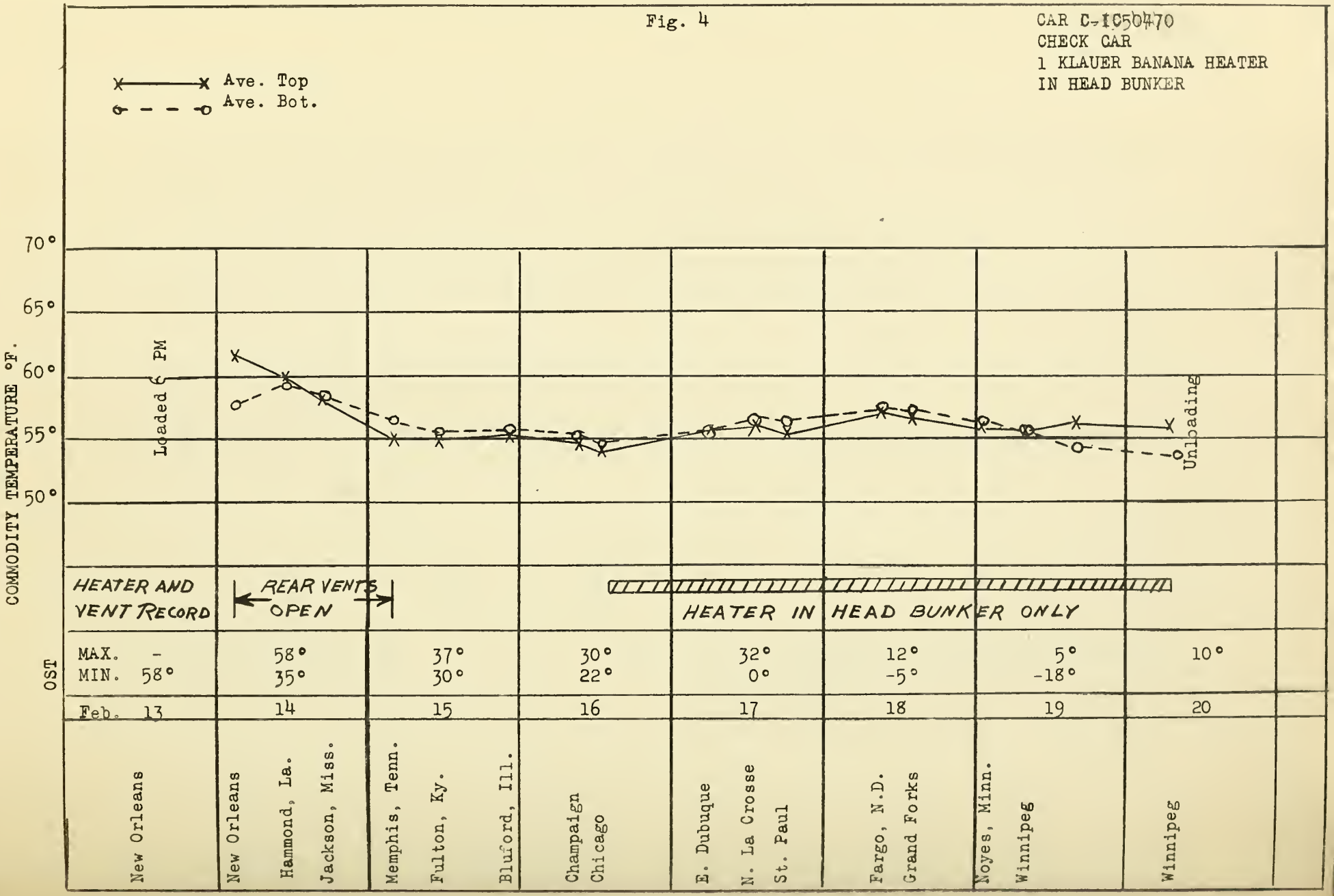


Fig. 5

CAR D IC-50437
MANUALLY CONTROLLED
UNDERSLUNG HEATER

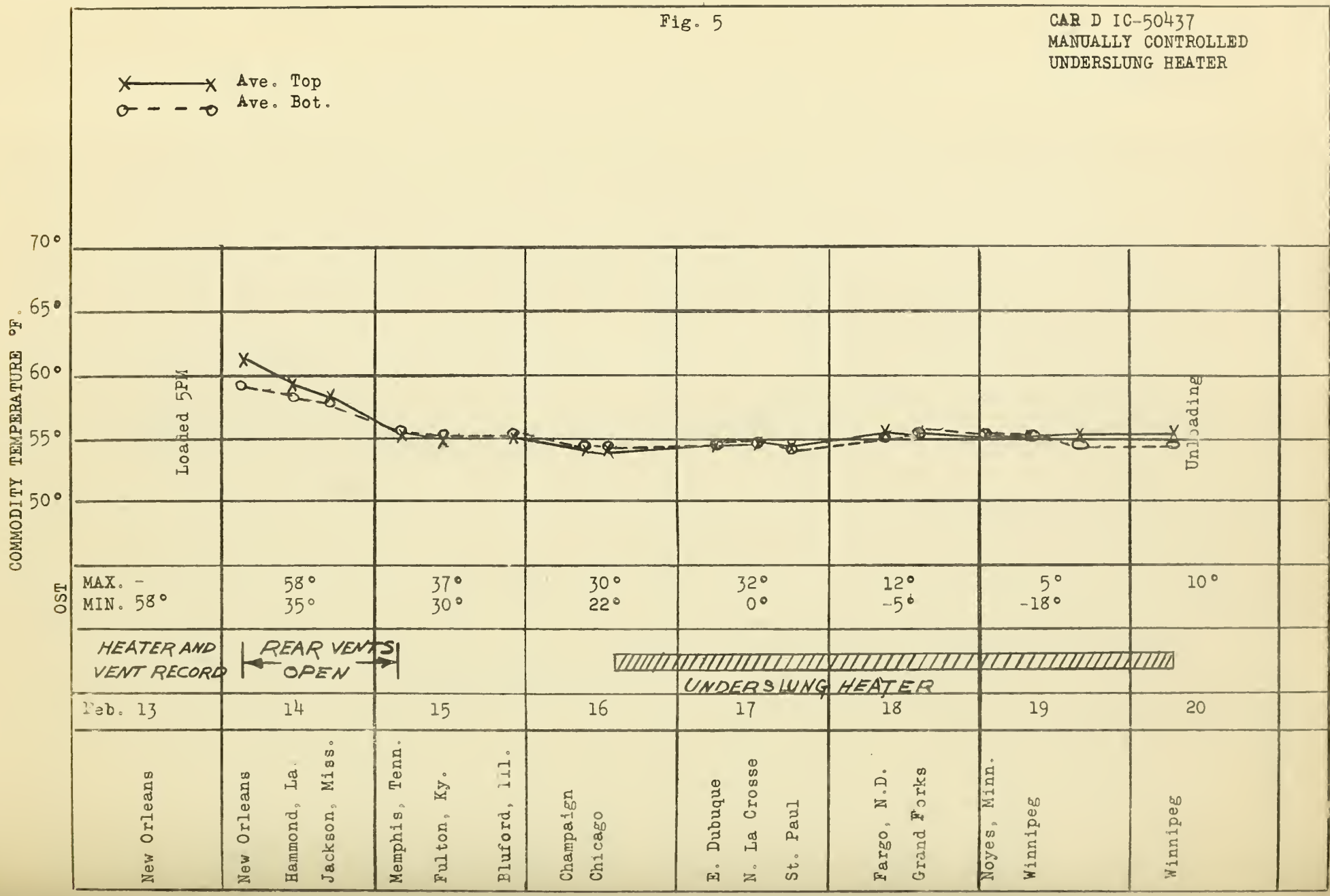


Fig. 6

CAR E IC-50441
CHECK CAR
ONE BANANA HEATER IN
HEAD BUNKER

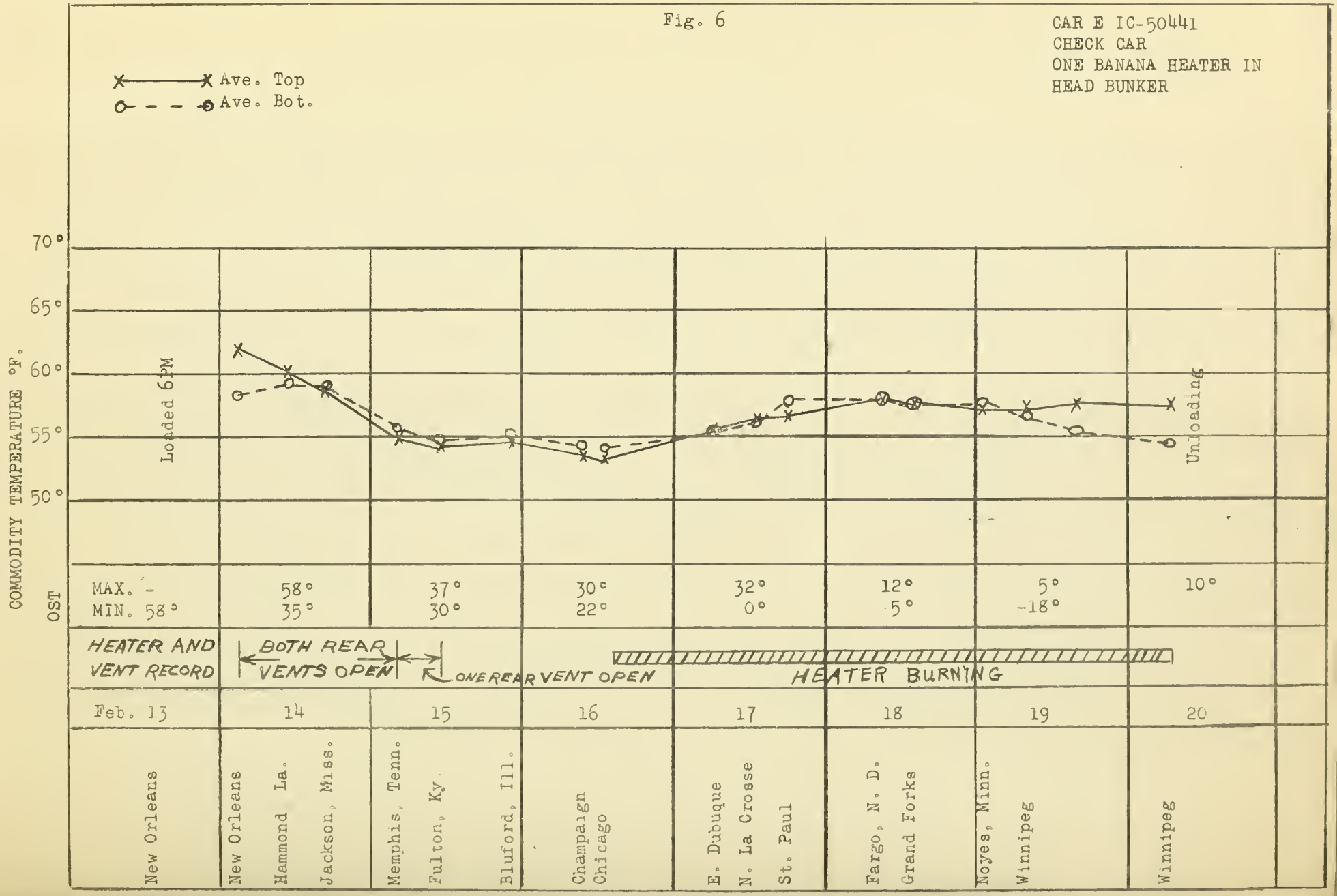


Fig. 7

CAR F BREX 74398
MANUALLY CONTROLLED
UNDERSLUNG HEATER

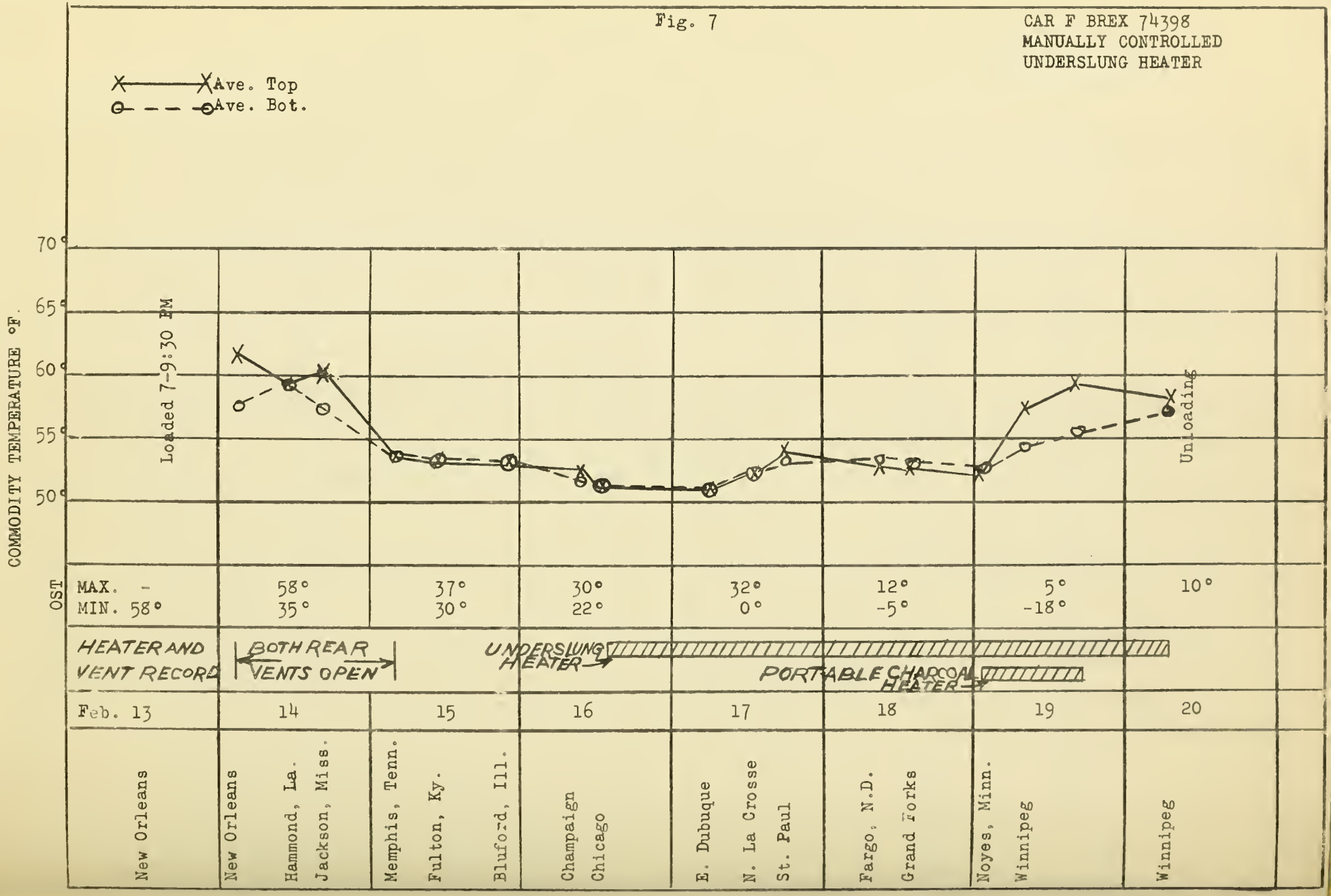
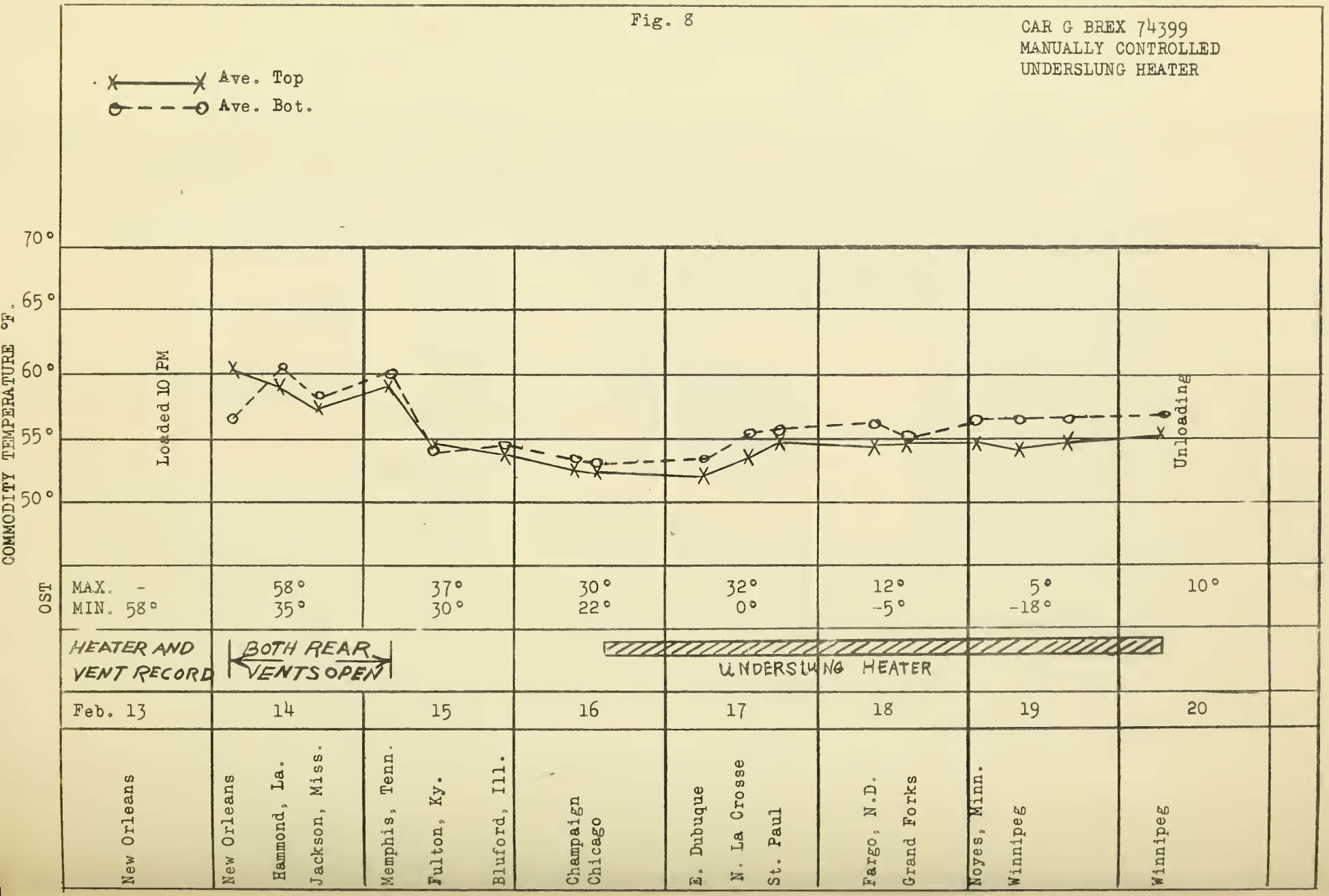


Fig. 8

CAR G BREX 74399
MANUALLY CONTROLLED
UNDERSLUNG HEATER